

Interactive comment on “An approach to retrieve information on the carbonyl fluoride (COF₂) vertical distributions above Jungfrauoch by FTIR multi-spectrum multi-window fitting” by P. Duchatelet et al.

P. Duchatelet et al.

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We thank the reviewer for her/his comments. In the following, **her/his comments or questions [RC]** are followed by our responses [AC].

Specific comments

[RC] p.3168, I.23: Please report in the abstract the main finding on the observed trend, rather than just describe what you have done.

[AC] The following sentence has been inserted p.3168 I.25: "For FTIR and KASIMA time series, very low COF₂ growth rates (0.4 ± 0.2 %/year and 0.3 ± 0.2 %/year, respec-

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tively) have been derived. However, the SLIMCAT data set gives a slight negative trend (-0.5 ± 0.2 %/year), probably ascribable to discontinuities in the meteorological data used by this model."

[RC] p.3137, I.17: Could you describe in a few more words what is meant by a "fixed signal-to-noise ratio of 250"?

[AC] The measurement covariance matrix S_e (sometimes reported as the measurement noise covariance matrix) adopted for our retrievals was chosen diagonal with all values identical. The diagonal values of S_e represent the inverse square of the signal-to-noise ratio used for the retrievals, for which it turned out that the best choice was 250. The sentence p.3173 I.17 has been modified like this: "The signal-to-noise ratio used during the retrievals and allowing to define diagonal elements of the diagonal measurement covariance matrix S_e was fixed to 250, following the L-curve method."

[RC] p.3179, I.26: I am a bit confused here on the use of the statistics. Are the values given here the mean difference and the standard deviation of the relative difference? The standard error for the mean difference would then be $1/\sqrt{n}$ times the standard deviation, if n is the number of common days. Has this been taken into account for the numbers given here?

[AC] No, it did not as the two values reported here are the mean difference and the standard deviation around the mean difference (denoted σ). The standard error on the mean (denoted $\frac{\sigma}{\sqrt{n}}$) can be easily estimated by the reader, as $n=215$. In both cases (total and partial columns), corresponding standard errors are close to 0.5%.

[RC] p.3182, I.16: I can't see any error bars in Fig. 6.

[AC] Error bars have been added. Thank you.

[RC] p.3182, I.25: I find this statement on nudged ECMWF data confusing. I guess KASIMA is nudged by ECMWF data, and not "before KASIMA runs, ECMWF data are nudged to the KASIMA model". Please clarify.

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[AC] The old sentence (p.3182, l.24): "However, the KASIMA time series is not affected by these changes in ECMWF vertical resolution, probably because, before KASIMA runs, ECMWF data are nudged to the KASIMA model environment in order to yield a realistic age of air (R. Ruhnke, private communication, 2008)" has been rewording like this: "However, the KASIMA time series is not affected by these changes in ECMWF vertical resolution as the calculation of the vertical velocities is different compared to SLIMCAT and as the ECMWF data are nudged to the KASIMA model environment in order to yield a realistic age of air (Reddmann et al., 2001)."

[RC] p.3183, l.1: In which sense is the variability in KASIMA smaller? The seasonal cycle is larger. On p. 3184, l. 11 below, it is stated that there is a limited variability in SLIMCAT.

[AC] After verification, it appears that uncertainties affecting SLIMCAT trends are erroneous, as a mistake has occurred during the error estimation procedure. We are sorry for this blunder. Corrected values are the following: the SLIMCAT linear trend for the 2000-2008 time period is $-4.0 \pm 1.9\%$ (or $-0.5 \pm 0.2\%/year$). Compared to FTIR and KASIMA errors, these values are of the same order of magnitude and will be inserted in the text as well as in the abstract. As a consequence, the sentence (p.3184 l.11): "The very low uncertainty (when considering only one significant digit) affecting the SLIMCAT annual trend probably reflects the limited variability characterizing COF2 profiles deduced from SLIMCAT runs" has been deleted. Regarding this correction, the sentence p.3183 l.1 is still valid: even if the amplitude of the KASIMA seasonal cycle is the largest, it clearly appears from Figure 6 that the variability of KASIMA individual data points is small compared to FTIR and SLIMCAT data sets.

Technical correction

[RC] p.3168, l.20 "If we..." -> "While we ..."

[AC] Corrected. Thank you.

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[RC] p.3171, l.8 "models" -> "model"

[AC] Corrected. Thank you.

[RC] p.3172, l.29: I don't think including private communication with a co-author of the paper is appropriate or useful. Please simply remove the private communication. This applies also to pages 3182 (twice), 3185 and 3186.

[AC] These 5 references to private communications have been removed.

[RC] p.3181, l.21: "form" -> "from"

[AC] Corrected. Thank you.

[RC] p.3186, l.18: "inverse" -> "invert" (or retrieve)

[AC] Corrected. Thank you.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 3167, 2009.

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